

FOSSIL POLYCHAETES FROM THE UPPER CRETACEOUS ROCK FORMATIONS OF SOUTH INDIA—PART I

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in this type of material, it may be possible to sort out such of the morphological features as may enable us to use this group of fossils also more purposefully than it has been hitherto possible to do.

From the Indian sub-continent annelid fossils have been recorded at various horizons from the Vindhyan upwards, and sometimes are reported

* *Vide* Part II to follow under *Rotularia* and *Burtinella*.

to occur in abundance and presenting a great variety (Blanford, 1862, p. 78). But reference is generally made to them scarcely beyond their mention as *annelids* or *worms* or *serpulids*. Out of hardly a dozen polychaetan species that have been described in any detailed manner from this vast region, six or seven* are from the Upper Cretaceous rocks of South India described by Stoliczka a hundred years ago. Rama Rao as far back as 1925 had presented to the Geology Section of the Indian Science Congress a paper on serpulids from the South Indian Cretaceous Formations. In the Abstract of that paper he is reported to have paid special attention to the tube wall. But we have not been able to locate the full text of that paper.

In the systematic part of the present paper we have followed, except where otherwise indicated, Regenhardt (1961) in his classification of the *Serpulidae*.

General Remarks on the Polychaetan fauna, as a whole, from these formations will appear in the Second Part of this Series, where the remaining members of this group will be reported.

CO-ORDINATES OF LOCALITIES CITED IN THE TEXT

- (1) Ariyalur $11^{\circ} 07' 30''$: $79^{\circ} 04' 30''$, (2) Kallankurichchi $11^{\circ} 09'$: $79^{\circ} 07' 30''$
- (3) Mallur $11^{\circ} 04' 30''$: $79^{\circ} 05'$, (4) Mettal $11^{\circ} 05' 40''$: $79^{\circ} 00' 30''$,
- (5) Odium $11^{\circ} 13'$: $78^{\circ} 59' 30''$, (6) Pondicherry $11^{\circ} 56'$: $79^{\circ} 50'$,
- (7) Saradamangalam $11^{\circ} 03' 30''$: $78^{\circ} 57'$, (8) Sillakudi $11^{\circ} 04' 30''$: $79^{\circ} 00', 30''$,
- (9) Uttattur $11^{\circ} 04'$: $78^{\circ} 51'$.

DESCRIPTION OF SPECIES

Family : SERPULIDAE Burmeister, 1837

Subfamily : FILOGRANINAE Rioja

Tribe : FILOGRANAE Regenhardt, 1961

Genus : *Glomerula* Nielsen, 1931.

Glomerula gordialis Schlothe. 1820

(Pl. VIII, Fig. 3)

1833 *Serpula plexus* Sow. : Woodward, p. 47, and 51.

1837 do. : Sowerby, p. 201, Pl. 598, Fig. 1.

1840	<i>S. implicata</i> Hagenow	: Hagenow, p. 668, Pl. 9, Fig. 17.
1841	<i>S. gordialis</i> Schloth.	
1841	<i>S. plexus</i> Sow.	
1841	<i>S. parvula</i> Münster	}
1841	<i>S. implicata</i> Hagenow	: Roemer, pp. 99-100
1850	<i>S. plexus</i> Sow	: Sowerby, p. 353, Pl. 28, Fig. 12.
1863	<i>S. gordialis</i> Schloth.	: Mørch, p. 452.
1873	<i>S. cf. gordialis</i> Schloth. (in part)	: Stoliczka, p. 64., Pl. 12, Fig 7 (Non-Fig. 8).
1875	<i>S. gordialis</i> Schloth.	: Geinitz, pp. 282-83, Pl. 63, Figs. 2-3.
1934	<i>S. aff. gordialis</i> Schloth.	: Collignon, M., p. 10, Pl. 1, Figs. 2, 2 .
1961	<i>Glomerula goraialis</i> (Schloth.)	: Regenhardt, pp. 26-27, Pl. 1, Fig. 2.
1962	do.	: Orlov, p. 452, Pl. 3, Fig. 7.

Material.—5 specimens; Klk 81/70, Klk 172/70, Ma 651/70, etc.

Dimensions.—Outer diameter of the tube—1 to 1.5 mm: Inner diameter of the tube—0.75 mm (Approx.)

Description.—By the rounded labyrinthically coiled tube, with almost constant diameter and adjacent coils uncemented, present material is assignable to this species.

[It is found attached to shells of ammonite and *Ostrea (Alectryonia) cupelloides* Stol., *Plicatula (Plicatula) multicostata* Forbes and a test of *Epiaster nobilis* Stol. as also as unattached free specimens.]

Remarks.—Regenhardt (1961, p. 26) has taken Stoliczka's *Serpula* cf. *gordialis* Schloth. (Pl. 12, Figs. 7 and 8) under the synonymy of *Glomerula gordialis* (Schloth). But on examining Stoliczka's material in the collection of the Geological Survey of India, we find that these two specimens are two different forms and Regenhardt (1961, p. 26) had probably through oversight placed both of them together under *Glomerula gordialis* (Schloth.). So here we place under the present species Stoliczka's specimen G.S.I. No. 1838 illustrated by him as Fig. 7 on Pl.12; and the specimen G.S.I. No. 1839 illustrated by him as Fig. 8 on Pl. 12, under *Sarcinella sarcinella* Regenhardt for which *vide infra*.

Geinitz (1875, p. 282) has included *S. gordialis* var. *serpentina* Goldf. in the synonymy of *S. gordialis* Schloth.; and Dacqué (1903, p. 358) has included it in the synonymy of *S. lombricus* (Defrance) Peron. The specimen illustrated by Geinitz (1875, Pl. 37, Fig. 3) is not placeable under the present species; but by its coiling habit and shape it is likely to belong to the genus *Rotularia* Defrance, though in the absence of any clear indication of narrowing of its aperture even that position may be somewhat doubtful.

Regenhardt (1961, p. 27) mentions this species as occurring also from Jurassic strata. But in view of the paucity of determinative characters in fossil polychaetan material it is neither easy to discriminate between very closely similar specimens coming from even widely different horizons; nor is it easy to imagine that a species has lived over so long a period as to cover Jurassic as well as Cretaceous; it may also be mentioned that the latter is not impossible. So we are not sure if the Jurassic material can also be assigned to this species as done by Regenhardt. In view of our appreciating Stoliczka's attitude as expressed by him in connection with *Sarcinella filiformis* (Sow.) (for which *vide infra*), we feel that the Jurassic specimens assigned by Regenhardt to the present species may belong to some other species; at any rate the material deserves a close scrutiny.

Occurrence.—Calcareous grits from Ariyalur group in Kallar river bed near Kallankurchchi and sandy limestone at about a km south of Mallur.

Distribution.—Stoliczka's material is from grey sandstone of Ariyalur group. Outside India, this species has a wide occurrence, being reported from Chalk of Norfolk, Sussex and Norwich; Turonian of Madagascar; Lower Quader (Cretaceous) of Sachsen; Upper Cretaceous of Gehrden, Rugen (Germany); and Senonian of Europe. According to Regenhardt (1961, p. 27) it is also well distributed in Jurassic, for which *vide* our remarks above.

Genus: *Sarcinella* Regenhardt, 1961

Sarcinella filiformis (Sow.), 1836

(Pl. VIII, Fig. 1)

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|-------------------------------------|--|
| 1836 <i>Serpula filiformis</i> Sow. | : Sowerby, p. 340, Pl. 16, Fig. 2. |
| 1858 do. | : Pict. & Ren. pp. 17–18, Pl. I, Figs. 11 a, |
| (in part) | 13 b, 15 (Non-Fig. 10, 11 b, 12, 13 a,
14). |

- 1863 *Serpula filiformis* Sow. (in part): Mørch, p. 451.
 1873 do : Stoliczka, p. 63, Pl. 12, Fig. 6.
 1897 do : Kossamat, pp. 96, 107, Pl. 10, Fig. 7.

Material.—One cluster of about 40 tubes; Me 223/70.

Dimensions.—Outer diameter of the tube—0·5 mm (approx.) to 0·75 mm.

Remarks.—This twisted bundle of about 40 short, smooth, tubes with circular cross-section is identified with *Serpula filiformis* Sow. as described and figured by Sowerby and the material described by Stoliczka (1873, p. 63, Pl. 12, Fig. 6) from light grey sandstone of Ariyalur group at Ariyalur in all respects.

In the absence of any observable morphological differences Stoliczka (1873, p. 63) followed Sowerby (1836, p. 340) in naming his serpulid material from the Upper Cretaceous of S. India as *Serpula filiformis* Sow. to distinguish it from *S. socialis* Goldf. (in part) from the Jurassic on the ground that the Jurassic species is not much likely to have lived over so long a period. Regenhardt (1961, pp. 29–30) on the other hand for want of observable morphological features of determinative significance has placed together several species coming from strata so widely different as from Devonian to Upper Cretaceous under one species, viz., *Sarcinella socialis* (Goldf.). Where morphological characters fail to serve us, as may sometimes happen in fossil polychaetan material, both the above attitudes may appear to have something to commend. Though so long a time range for a species as implied by the above attitude of Regenhardt may not be impossible, the idea of more restricted time range appears to us more acceptable. And therefore, following Stoliczka, we have placed our present material under Sowerby's species, rather than to accept the name *Sarcinella socialis* (Goldf.) as done by the Regenhardt.

While placing *Serpula filiformis* Sow., as synonymous with *S. socialis* Goldf., Geinitz (1875, p. 200, Pl. 37, Fig. 2) has placed under *S. socialis* two different forms which differ in their diameter. Of these the specimen figured by Geinitz as 2 b agrees by its diameter with *S. filiformis* (Sow.) and the specimen shown by him in Fig. 2 a having a wider diameter, should be placed under some other Cretaceous species, because according to our attitude as indicated above the name *S. socialis* (Goldf.) should be reserved for a pre-Cretaceous species.

Occurrence.—Calcareous grayish sandstone from Ariyalur group at about 2 km south-west of Mettal, between Mettal and Sillakudi.

Distribution.—This species is reported from Aptian of St. Croix (Switz.) and within India it is reported also from Valudayur Beds (Pondicherry).

Sarcinella sarcinella Regenhardt, 1961

(Pl. VIII, Fig. 9)

1873 *Serpula cf. gordialis* Schloth. : Stoliczka, p. 64, Pl. 12, Fig. 8 (Non-
(in part) Fig. 7).

1961 *Sarcinella sarcinella* Reg. : Regenhardt, p. 29, Pl. I, Fig. 6.

Material.—One bundle; Klk 171/70.

Dimensions.—Outer diameter of the tube—1 to 1.5 mm. Inner diameter of the tube—0.75 mm (approx.). Length of the bundle of tubes—18 mm (approx.) (There are signs of breakage of the tube ends.)

Remarks.—Our present specimen, consisting of about 15 tubes, agrees well with *Sarcinella sarcinella* Reg. (Regenhardt, p. 29, Pl. I, Fig. 6) from Coniacian of La Ribochere, France and Stoliczka's specimen, G.S.I. No. 1839 illustrated by him (*op. cit.*). Also see under *Glomerula gordialis* described here earlier.

Occurrence.—Calcareous grits from Ariyalur group in Kallar River bed near Kallankurchchi.

Subfamily : *SERPULINAE Rioja*

Tribe : *SERPULAE* Regenhardt, 1961

Genus : *Parsimonia* Regenhardt, 1961

Parsimonia ootatoorensis (Stol.), 1873

(Pl. VIII, Fig. 8)

1873 *Serpula ootatoorensis* Stol. : Stoliczka, p. 64, Pl. 12, Figs. 9–10.

1875 do. : Geinitz, p. 283, Pl. 63, Figs. 4–5.

1959 do. : Besairie and Collignon, p. 199.

Material.—Two specimens; Od 229/70, Od 230/70.

Dimensions.—Outer diameter of the tube—6 to 7 mm. Inner diameter of the tube—4.5 to 5.5 mm.

Remarks.—Except that the transverse rugosities are a little more conspicuous in our specimens, the present material agrees well with *Serpula ootatoorensis* Stol. described by Stoliczka from earthy limestone of the Uttattur group at Odiyam and Uttattur. In one of our specimens two tubes are seen attached to one another.

Occurrence.—Earthy limestone from Uttattur group at about 2 km north-east of Odiyam.

Distribution.—This species is also reported from Cenomanian of Diego-Suarez (N.E. Madagascar) and Lower Quader (Cretaceous) of Sachsen (Germany).

Tribe : SPIRASERPULAE Regenhardt, 1961

Genus : *Omasaria* Regenhardt, 1961

Omasaria simplex sp. nov.

(Pl. VIII, Fig. 11)

Material.—Single specimen: *Holotype* No. Od 220/70.

Description.—The tube is calcareous, smooth, and regularly meandering, with circular cross-section and loops rather close to each other, though loosely coiled portions are also present. The tube on the whole gradually tapers backwards, but shows at irregular intervals slight bulging over a short distance. The diameter of the tube at the narrower end is less than half mm and at the other end it is nearly one mm. It is attached along whole length to a fragment of a bivalve shell.

Remarks.—In comparison with *O. funiculus* (Wollemann) (Regenhardt, 1961, p. 45, Pl. 3, Fig. 1) from Upper Hauterivian of N. Germany and French Jura and from Neocomian of Thiede, Ahlum, the present species has no overlapping of the loops, the winding of the tube is more regular, and has a smaller and more gradually increasing diameter.

Serpula filiformis as figured by Pictet and Ren. (1854–58) in Fig. 13 b on Pl. 1 from Aptian of St. Croix is much like the species described here but as the details of description are not given by them, it is difficult to compare these two forms in any detailed manner.

Occurrence.—Earthy limestone from Uttattur group at about 2 km north-east of Odiyam.

Omasaria variabilis sp. nov.

(Pl. VII, Fig. 4)

Material.—Single specimen, *Holotype* No. Sd 11/70.

Description.—Calcareous, simple tube with circular cross-section and less than one mm in diameter is coiled in one plane. After the early 4 or 5 close coils it follows an irregular course. The diameter of the total coil is about 6 mm. The tube is attached along its entire length. The species is found attached to an ammonite shell in association with *Glomerula gordialis* (Schlothe.).

Remarks.—From *O. simplex* described earlier this species differs by its variability in coiling.

As compared with *O. funiculis* (Wollemann) (Regenhardt, 1961, p. 45, Pl. 3, Fig. 1) from Upper Hauterivian of N. Germany and French Jura and from Neocomian of Thiede, Ahlum, the present species is only 1/3rd in dimensions and has more close coiling.

O. omnivaga Reg. (Regenhardt, 1961, p. 45, Pl. 5, Fig. 7) from Upper Maestrichtian of Vigny (France) and *O. parvula* (Münster) (Regenhardt, 1961, p. 46) from the Upper Cretaceous of Germany are spirally coiled and differ also in dimensions.

Occurrence.—Yellowish limestone from Trichinopoly group at about 1.5 km north-west of Saradamangalam.

Tribe.—PROLISERPULAE Regenhardt, 1961

Genus.—*Proliserpula* Regenhardt, 1961

Proliserpula (Proliserpula) ampullacea (Sow.), 1829

(Pl. VIII, Figs. 2, 7, 12)

1829	<i>Serupula ampullacea</i> Sow.	:	Sowerby, p. 199, Pl. 597, Figs. 1-4.
1833	do.	:	Wondward, pp. 47 and 50.
1840	do.	:	Hagenow, p. 668.
1841	do.	:	Roemer, p. 101.
1875	do.	:	Geinitz, p. 284, Pl. 63, Figs. 11 and 12 (Non-Fig. 10); Pt. II, Pl. 37. Figs. 6-9.
	(in part)		

1961 *Proliserpula (Proli.) ampullacea* (Sow.): Regenhardt, pp. 54-55.

Material.—Two specimens: Od 75/70, Od 219/70.

Dimensions.—Shorter diameter at aperture—2–3 mm. Longer diameter at aperture—5–6 mm.

Remarks.—Out of the two available specimens one (Od 75/70) is a single tube, while the other (Od 219/70) is a cluster of 4 or 5 tubes of which two have started almost together and the other at later stages. Both these specimens are otherwise identical in their structure of the individual tubes. They are attached to one another all along their length. Such clustered specimens are described and figured by Sowerby (1829, p. 199, Pl. 597, Figs. 1–4) with which our specimens agree fully by their short loosely coiled tubes, sub-circular cross-section, rapidly increasing diameter and growth wrinkles slightly deflected forward to form a peripheral keel along entire length of tube.

Occurrence.—Earthy limestone from Uttattur group at about 2 km north-east of Odiyam.

Distribution.—This species has a wide occurrence, being reported from chalk of Norwich, Lower Quader (Cretaceous) of Sachsen (Germany) and Senonian of Denmark.

Subfamily: *LACINITUBINAE* Subfam nov.

Diagnosis.—Short conical serpulid tubes with wing-like development and attached along its entire length.

Remarks.—By their not-coiled nature (excepting a slight general curvature with the hook-like apical portion) and the wing-like development of the tube, these polychaetes have a very characteristic appearance not seen in any of the serpulids on record, fossil or recent. This impels us to make this material the basis of a new sub-family lacinitubinae. With the limited, though well preserved, material available for study it is difficult at present to indicate its exact relation to other sub-families under Serpulidae; but it may not be much unrelated to Ditrupinae, because of the conical nature of the tube with tendency to rapid increase in diameter, and to the subfamily Serpulinae through the genus *Proliserpula* by its tendency to rapid increase in diameter to give conical or trumpet-like tube.

The name is based on the wing-like development along the tube (Lacina = wing, flap).

Geological Time Range.—The present material is from Ariyalur group of South Indian Cretaceous (Senonian-Maestrichtian).

Genus: Lacinituba gen. nov.

Type species: Lacinituba mallurensis sp. nov.

Diagnosis.—Conical tube attached along its entire length with almost flattened undersurface; sub-elliptical cross-section and transversely wrinkled, apically hooked, the tube is with a flap along its length on the side away from hooked end.

Remarks.—With the limited number of specimens available to us it has not been possible to ascertain if the apertural diameter is reduced internally to any extent at the last stage of growth; but one of the specimens with us does give indication of such an appearance.

Vermilliopsis Saint-Joseph, 1906 (Howell, 1962, p. W161) has a conical hooked tube like that of the present genus, but lacks the wing-like flap which is so characteristic a feature of the present genus; hence these two genera cannot be confused with one another.

Lacinituba mallurensis sp. nov.

(Pl. VIII, Figs. 10 and 14)

Material.—Three specimens, *co-types* No. Ma 53/070, A, B and C.

Dimensions.—Diameter of tube at the wider end—2 to 3 mm. Length of tube—15 mm.

Description.—The tubes are rather short, a little bent and with early portion turned in a hook-like manner. They are attached to substratum along most of their length with a wing-like flap adhering to the surface of attachment on the side away from the hook-like bend of the tube. They are sub-elliptical in cross-section, the diameter increasing with length of the tube. Transverse growth wrinkles on the surface of the tube extend on the flap: they become more conspicuous at intervals which are apparently not regular. The tubes are found attached to *Nautilus* shell.

Remarks.—A reference may be made to *Vermilliopsis iifundibulum* (Langerhanz) a Neogene form from Europe (Howell, 1962, p. W161, Fig. 99.9) because of its general hooked nature of the early part of the tube. But the generic characters as indicated above particularly the flap are so distinct that these two forms cannot be confused with one another.

Occurrence.—Sandy limestone from Ariyalur group at about 1 km south of Mallur.

Subfamily : *DITRUPINAE* Regenhardt, 1961

Tribe : *DITRUPAE*, Regenhardt, 1961

Genus : *Ditrupa* Berkeley, 1835

Ditrupa (Ditrupa) rugosa sp. nov.

(Pl. VIII, Fig. 6)

Material.—Two specimens, *Holotype* No. Od 226/70.

Description.—Tube is calcareous, short, circular in cross-section, rough, moderately bent and tapering backwards. Outer diameter of the tube at the wider end is 4 to 5 mm and 3 mm at the other end; thickness of the tube wall is 1 mm and carries transverse rugose structure on the outer surface.

Remarks.—In comparison to *D. (D.) vittata* Reg. (Regenhardt, 1961, p. 71, Pl. 7, Fig. 6) from the Lower Maestrichtian of Achen, our species is more slender. On the same grounds it differs from *D. (D.) mosae* (Bronn.) from the Upper Maestrichtian of Belgium (Regenhardt, 1961, p. 72, Pl. 3, Fig. 9).

Occurrence.—Earthy limestone from Uttattur group at about 2 km north-east of Odiyam.

Ditrupa (Ditrupa) brevituba sp. nov.

(Pl. VIII, Fig. 5)

Material.—Single specimen; *Holotype* No. Sd 423/70.

Description.—It is a calcareous, short, moderately curved tube, circular in cross-section with outer diameter 3 mm at the wider end, and gradually narrowing backwards to less than half mm at the other end. The length of the tube is 22 mm. It shows fine growth striae which are not strictly transverse, but are slightly oblique forward on the convex side. The distance between consecutive striae varies from a little less than 0.5 mm to 0.75 mm, and they are more prominent at intervals of about 2–3 mm. The diameter of the tube shows a marked increase at a distance of 4 mm from the thinner end.

Remarks.—As compared with *Ditrupa? longisima* Forbes (Forbes, 1846, p. 157, Pl. 19, Fig. 13 and Stoliczka, 1873, p. 65, Pl. 12, Fig. 12) from Ariyalur group, the present form differs in being much less curved and probably also shorter.

Ditrupa cornea (Linné) from the Pliocene of Italy (Howell, 1962, p. W 156, Fig. 99.4) is slender and curved like our specimen but has its diameter growing suddenly at several stages, while in our species this is seen to happen only once near the thinner end.

Occurrence.—Brownish limestone from Trichinopoly group at about 1 km north-west of Saradamangalam.

Tribe : FISSURITUBAE Tribe nov.

Type : *Fissurituba* gen. nov.

Diagnosis.—Calcareous cylindrical tube with a sharp longitudinal fissure, several longitudinal ridges and transverse growth wrinkles.

Genus : *Fissurituba* gen. nov.

Type : *Fissurituba cretacea* sp. nov.

Diagnosis.—Calcareous tube internally circular with diameter almost constant; seven longitudinal sharp almost equally spaced ribs separated by shallow depressions, and one sharp longitudinal fissure; feeble transverse growth wrinkles.

Remarks.—The longitudinal fissure may have its edges feebly thickened but they should not be mistaken as longitudinal ribs at the edges of the fissure. The tube may show tendency to a slight bending on one side and perhaps also a feeble twisting. The longitudinal fissure is situated between the two ribs which are relatively more apart than others. The growth wrinkles are irregular in spacing and relief. The available specimen has not revealed signs of attachment along the length of the tube. The sharp longitudinal fissure distinguishes this genus from all the other ribbed genera under Ditrupinae.

The almost constant diameter of the tube and several longitudinal ribs may take this new genus under the tribe Hamuli, *Hepteras* being perhaps the nearest genus. But the fissured nature of its tube needs placing it in a new tribe Fissuritubae, since the fissure indicates a distinct and important difference

in the nature of the body wall of the animal as compared to that in the other tribes.

Fissurituba cretacea sp. nov.

(Pl. VIII, Fig. 13)

Material.—One specimen; *Holotype* No. Ma 652/70.

Dimensions.—Outer diameter of the tube—6.5 mm. Inner diameter of the tube—5.0 mm.

Description.—A single specimen about 20 mm long is available in our collection. It has an almost circular and smooth inner surface and carries a longitudinal fissure along the entire length. The outer surface with 7 longitudinal ridges, nearly equally spaced, shows transverse rugosities. Its diameter at both the ends is almost the same.

Occurrence.—Sandy limestone from Ariyalur group at about 1 km south of Mallur.

ACKNOWLEDGEMENTS

Dr. G. B. Deodikar, Director, Maharashtra Association for the Cultivation of Science, has obliged us by providing the necessary facilities and by his interest in the present work. To the Director-General, Geological Survey of India, we are thankful for library facilities and for access to the type specimens in their collection. Dr. M. V. A. Sastry and his colleagues in the Palaeontology Division, Geological Survey of India, have been helpful to us with their comments. We are much thankful to Prof. L. Rama Rao for useful suggestions in connection with our field work. Dr. D. R. Ranade, Department of Zoology, University of Poona, has helped us by his useful discussion. Our colleagues Dr. V. D. Vartak, Mr. R. M. Badve and Mr. V. D. Borkar were very helpful during the field work and also otherwise. Part of this work was made possible by the financial help from the U.G.C. in the form of a Junior Research Fellowship to the Junior author.

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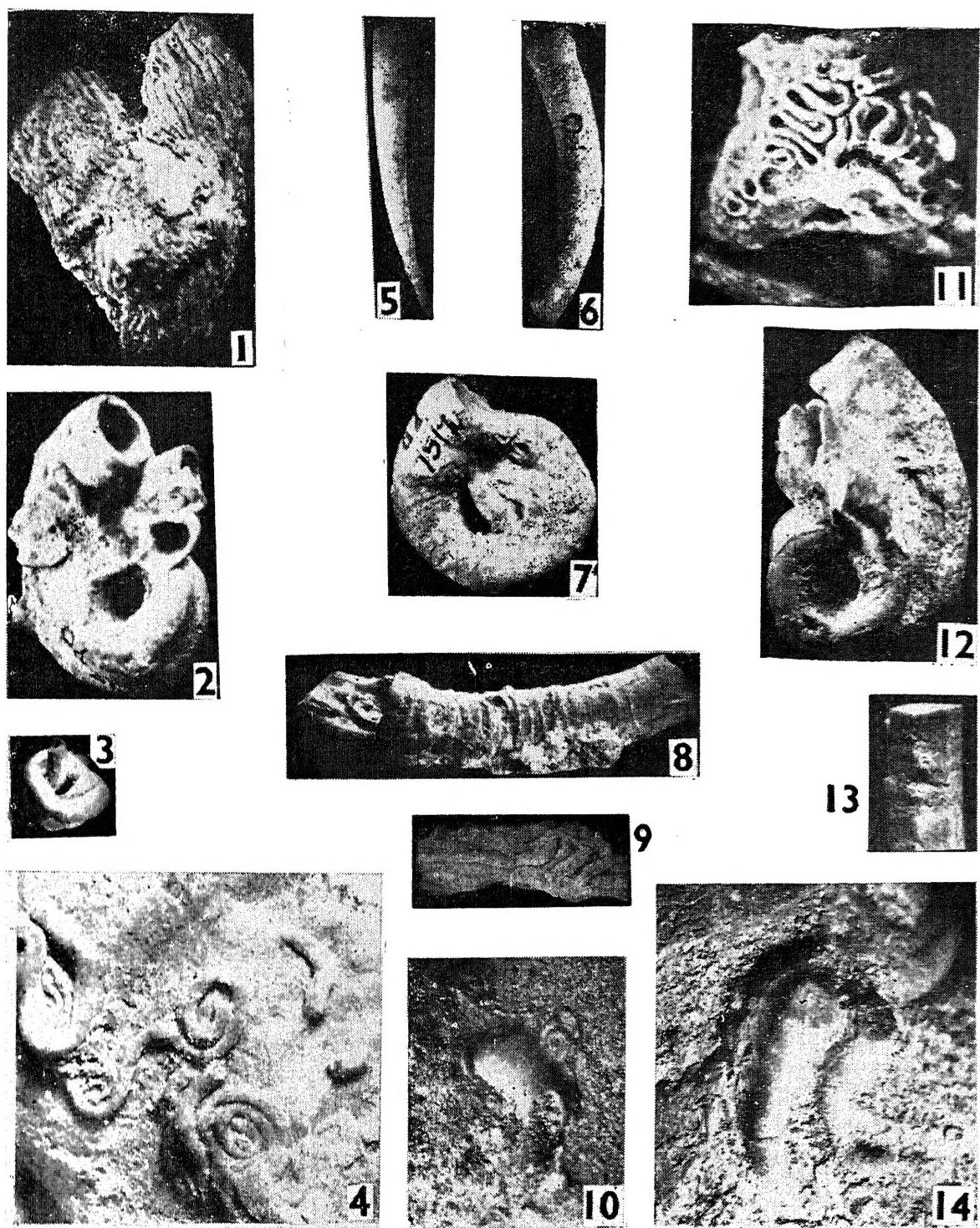
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EXPLANATION OF PLATE VIII

- FIG. 1. *Sarcinella filiformis* (Sow.), $\times 2$.
- FIGS. 2, 7 and 12. *Proliserpula (Prol.)i. ampullacea* (Sow.), $\times 2$.
- FIG. 3. *Glomerula gordialis* (Schloth.), $\times 2$.
- FIG. 4. *Omasaria variabilis* sp. nov., $\times 4$.
- FIG. 5. *Ditrupa (Ditrupa) brevituba* sp. nov., $\times 10/3$.
- FIG. 6. *Ditrupa (Ditrupa) rugosa* sp. nov., $\times 8/3$.
- FIG. 8. *Parsimonia ootatoorensis* (Stol.), $\times 2$.
- FIG. 9. *Sarcinella sarcinella* Reg., $\times 2$.
- FIGS. 10 and 14. *Lacinituba mallurensis* sp. nov., $\times 8/3$.
- FIG. 11. *Omasaria simplex* sp. nov., $\times 8/3$.
- FIG. 13. *Fissurituba cretacea* sp. nov., $\times 2$.



FIGS. 1-14

